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(54) INFORMATION RECORDING MEDIUM AND INFORMATION RECORDING
DEVICE THEREFOR

(57)Abstract:

PROBLEM TO BE SOLVED: To record information so that seamless reproduction is carried out when the reproducing layer of an optical disk having two layer structure is changed over by forming a recording layer having first and second storage capacity having different recording capacity.

SOLUTION: A plurality of data groups having at least one of image information and voice information respectively are recorded on an information recording medium with a first recording layer L1 having first storage capacity (a) and a second recording medium L2 having second storage capacity (b). The total Bsum of the quantities of data detected by a system controller is computed successively at that time each data group recorded on the recording layer L1 in succession when the total Bsum of the quantities of the data computed is decided in the storage quantity (a) or less and the lastly detected data group is recorded on the recording layer L2 when the quantity of data of the lastly detected data group reaches the storage capacity (b) or less.

CLAIMS

[Claim(s)]

[Claim 1] Data volume of each data group characterized by comprising the following which should be recorded is detected one by one. When the sum total of detected data volume is below the 1st storage capacity, each data group is recorded on the 1st recording layer one by one. An information recording medium recorded by the Information Storage Division device which records a data group detected by said last when data volume of a data group which the sum total of said data volume exceeded said 1st storage capacity and was detected at the end was below the 2nd storage capacity one by one on said 2nd recording layer.

The 1st recording layer that is recording a data group which has the 1st storage capacity and has either [at least] video information or speech information as the minimum unit.

The 2nd recording layer that is recording a data group which has the 2nd storage capacity and has either [at least] video information or speech information as the minimum unit.

[Claim 2] The Information Storage Division device characterized by comprising the following for recording two or more data groups which have either [at least] video information or speech information respectively on an information recording medium which has the 2nd recording layer that has the 1st recording layer and 2nd storage capacity that have the 1st storage capacity.

A data receiving means for receiving each data group which should be recorded on said information recording medium one by one.

A data volume detection means for detecting data volume of each received data group one by one.

The 1st calculating means for calculating the sum total of data volume detected by the data volume detection means concerned one by one.

The 1st judging means for judging one by one whether the sum total of data volume calculated by the 1st calculating means concerned is below said 1st storage capacity. The 1st recording device for recording each data group on said 1st recording layer one by one when the sum total of data volume calculated by said 1st calculating means is judged to be said below 1st storage capacity.

[Claim 3] The 2nd calculating means for calculating the sum total of data volume exceeding said 1st storage capacity one by one when judged with the sum total of data volume calculated by said 1st calculating means exceeding said 1st storage capacity. The 2nd judging means for judging one by one whether the sum total of data volume calculated by the 2nd calculating means concerned is below said 2nd storage capacity. The Information Storage Division device according to claim 2 provided with the 2nd recording device for recording a data group exceeding said 1st storage capacity on said 2nd recording layer one by one when the sum total of data volume calculated by said 2nd calculating means is judged to be said below 2nd storage capacity.

[Claim 4]The Information Storage Division device according to claim 2 or 3 characterized by calculating the sum total of said detected data volume in turn with many said 1st calculating means to data volume detected by said data volume detection means.

DETAILED DESCRIPTION

[Detailed Description of the Invention]

[0001]

[Field of the Invention]This invention belongs the informationincluding a picturea soundetc.represented by DVD to the technical field of the recorder for recording information on information recording mediasuch as a recordable high density optical diskand the information recording medium concerned with high density.

[0002]

[Description of the Prior Art]Conventionallyas an optical disc in which informationincluding a picturea soundetc.was recordedwhat is called LD (Laser Disk)CD (Compact Disk)etc. have become common widely.

[0003]In such LDpicture information and speech information are recorded with the hour entry which shows the time which should reproduce each information on the basis of the reproduction starting position which each LD has. For this reasonplayback of extracting and listening to only music to listen to among two or more music currently recordedor changing reproduction sequence at random and hearing it is [/ other than the general ordinary reproduction played in an order that the information currently recorded is recorded (for example CD)] possible.

[0004]

[Problem(s) to be Solved by the Invention]Howeverin the above-mentioned LD etc.the televiewer had a selection branch about the picture displayed or the sound reproducedand there was a problem that reproduction which was rich in what is called an interactive change of the televiewer concerned choosingviewing and listening to them could not be performed.

[0005]Namelywhen viewing and listening to the foreign film currently recorded on LD for exampleThe language used in the title currently displayed on the screen is chosen. (Choosing a Japanese title and the title of the original word) When making it display or hearing the music currently recorded on CDthe sound of the music can be chosen (for exampleit is chosen whether it is heard by English wordsor it is heard by Japanese words).

[0006]The proposal about DVD and development which are the optical discs which raised the storage capacity by about 10 times on the other hand without changing the size of the optical disc itself to the above-mentioned conventional CD now are prosperous. In the DVD concernedin order to make storage capacity increasethe disk structure whose recording layer is a bilayer is planned.

[0007]Howeverwhen switching the layer currently played during playback in the case of such an optical disc of the two-layer structurewhile switching the focal

distance of an optical pickup the address which should be played after a change must be searched. However when the change of the above-mentioned focal distance and the search of an address take a certain amount of time and data is continuing it is difficult not to break off and to reproduce an image or a sound (seamlessly). In such a case although it is possible to enlarge capacity of the track buffer of playback equipment dramatically or to perform seamless reproduction by reducing reproduction speed and reducing image quality and tone quality the former makes the manufacturing cost of a recorder increase and the latter is not preferred for a user.

[0008] Then SUBJECT of this invention enlarges capacity of the track buffer of playback equipment. When switching during playback the layer which is playing the optical disc of the two-layer structure without reducing reproduction speed it is in providing the information recording medium on which information was recorded by the recorder and the recorder concerned for recording information as seamless playback is possible.

[0009]

[Means for Solving the Problem] In view of an aforementioned problem the invention according to claim 1 detects data volume of each data group which should be recorded one by one. When the sum total of detected data volume is below the 1st storage capacity each data group is recorded on the 1st recording layer one by one. In an information recording medium recorded by the Information Storage Division device which records a data group detected by said last when data volume of a data group which the sum total of said data volume exceeded said 1st storage capacity and was detected at the end was below the 2nd storage capacity one by one on said 2nd recording layer. The 1st recording layer that is recording a data group which has the 1st storage capacity and has either [at least] video information or speech information as the minimum unit. It is constituted as it has the 2nd recording layer that is recording a data group which has the 2nd storage capacity and has either [at least] video information or speech information as the minimum unit.

[0010] According to the information recording medium constituted as mentioned above data volume of each data group which should be recorded is detected one by one. When the sum total of detected data volume is below the 1st storage capacity each data group is recorded on the 1st recording layer one by one. When data volume of a data group which the sum total of said data volume exceeded said 1st storage capacity and was detected at the end is below the 2nd storage capacity it is recorded as follows by the Information Storage Division device which records a data group detected by said last one by one on said 2nd recording layer. Namely while a data group which has either [at least] video information or speech information is recorded on the 1st recording layer that has the 1st storage capacity as the minimum unit a data group which has either [at least] video information or speech information is recorded on the 2nd recording layer that has the 2nd storage capacity as the minimum unit. Here it means ["a data group is recorded as the minimum unit" and] that can divide the data group concerned and

it cannot be recorded.

[0011]The invention according to claim 2 to an information recording medium which has the 2nd recording layer that has the 1st recording layer and 2nd storage capacity that have the 1st storage capacity. In the Information Storage Division device for recording two or more data groups which have either [at least] video information or speech informationrespectivelyA data receiving means for receiving each data group which should be recorded on said information recording medium one by oneA data volume detection means for detecting data volume of each received data group one by oneThe 1st calculating means for calculating the sum total of data volume detected by the data volume detection means concerned one by oneThe 1st judging means for judging one by one whether the sum total of data volume calculated by the 1st calculating means concerned is below said 1st storage capacityWhen the sum total of data volume calculated by said 1st calculating means is judged to be said below 1st storage capacityit constitutes as it has the 1st recording device for recording each data group on said 1st recording layer one by one.

[0012]To an information recording medium which has the 2nd recording layer that has the 1st recording layer and 2nd storage capacity that have the 1st storage capacity constituted as mentioned above. While each data group which should be recorded on said information recording medium by a data receiving means is received one by one according to the Information Storage Division device for recording two or more data groups which have either [at least] video information or speech informationrespectivelyData volume of each data group received by a data volume detection means is detected one by one. It is judged one by one whether the sum total of data volume which the sum total of data volume detected by the data volume detection means concerned was calculated one by one by the 1st calculating meansand was calculated by the 1st judging means by the 1st calculating means concerned is below said 1st storage capacity. And when the sum total of data volume calculated by said 1st calculating means is judged to be said below 1st storage capacityeach data group is recorded one by one on said 1st recording layer by the 1st recording device.

[0013]In the Information Storage Division device according to claim 2 the invention according to claim 3The 2nd calculating means for calculating the sum total of data volume exceeding said 1st storage capacity one by onewhen judged with the sum total of data volume calculated by said 1st calculating means exceeding said 1st storage capacityThe 2nd judging means for judging one by one whether the sum total of data volume calculated by the 2nd calculating means concerned is below said 2nd storage capacityWhen the sum total of data volume calculated by said 2nd calculating means is judged to be said below 2nd storage capacityit constitutes as it has the 2nd recording device for recording a data group exceeding said 1st storage capacity on said 2nd recording layer one by one.

[0014]When judged with the sum total of data volume calculated by said 1st calculating means exceeding said 1st storage capacity according to the Information Storage Division device constituted as mentioned aboveIt is judged

one by one whether the sum total of data volume which the sum total of data volume which exceeds said 1st storage capacity by the 2nd calculating means was calculated one by one and was calculated by the 2nd calculating means concerned by the 2nd judging means is below said 2nd storage capacity. And when the sum total of data volume calculated by said 2nd calculating means is judged to be said below 2nd storage capacity a data group which exceeds said 1st storage capacity by the 2nd recording device is recorded on said 2nd recording layer one by one. [0015] In the Information Storage Division device according to claim 2 or 3 the invention according to claim 4 is turned with many said 1st calculating means to data volume detected by said data volume detection means and it is constituted so that the sum total of said detected data volume may be calculated.

[0016]

[Embodiment of the Invention] Next the suitable embodiment for this invention is described. The embodiment described below describes the embodiment which applied this invention to the above-mentioned DVD.

[0017] In following embodiments the "data group" in Claims supports VTS (Video Title Set).

(1) Explain the physical and logical composition and its operation of DVD which is one gestalt of operation of the information recording medium with which this invention was applied at the beginning of the embodiment of an information recording medium using drawing 1 thru/or drawing 2.

[0018] The recording format (physical recording format) on DVD of introduction video information and speech information is explained using drawing 1. As shown in drawing 1 DVD1 of an embodiment has the read-in area LI in the most-inner-circumference part and has read-out-area LO in the outermost periphery part and in the meantime video information and speech information are divided and memorized by two or more VTS3 (VTS#1 thru/or VTS#n) which have ID (discernment) number in each. Here with VTS (Video Title Set). A related title (attribute such as a sound, the number of streams of a sub picture, specification, a correspondence language are the same) (a movie etc.) are one work which a maker is going to show to a televiewer the set (settlement) put together and more specifically for example about the one same movie even if two or more movies of a different language are the movies same in being recorded on each as a title the theater version and a special edition are memorized as a respectively different title. The video manager 2 is recorded on the head of the field where VTS3 is recorded. The information recorded as this video manager 2 for example the whole video information and speech information which are recorded on the DVD1 concerned such as a menu in which the name of each title is shown and an access table for accessing the information for illegal copy prevention or each title information is recorded.

[0019] Next VTS3 of 1 is divided and recorded on two or more VOB10 which have an ID number in each by making CDC 11 into a head. Here the portion constituted by two or more VOB10 is called VOB set (VOBS). This VOB set is considered as a VOB set about a part for the real soma concerned in order to distinguish CDC 11

which are other data which constitutes VTS3 and the portion of two or more VOB10 which are the substance of video information and speech information.

[0020] Information including PGC (Program Chain Information) etc. which are various information about the program chain which is the logical Type which combined two or more cells (a cell is mentioned later.) is recorded on CDC 11 recorded on the head of VTS3. A part for the real soma of video information and speech information other than control information (images or the sounds (itself) other than control information) is recorded on every VOB10.

[0021] VOB10 of 1 is constituted by two or more cells 20 which have an ID number in each. Here VOB10 of 1 is constituted so that it may complete by two or more cells 20 and the cell 20 of 1 does not straddle VOB10 of 2.

[0022] Next the cell 20 of 1 is constituted by two or more VOB units (VOBU) 30 which have an ID number in each. Here it is an information unit containing each of video information speech information and sub video information (the information on sub video images such as a title in a movie is said.) in the VOB unit 30.

[0023] And the VOB unit 30 of 1 is constituted by Navi-pack 41 the video pack 42 which has video information the audio pack 43 which has speech information and the sub picture pack 44 which has sub video information. Here the packet in which image data is contained as the video pack 42 is recorded and the packet in which voice data is contained as the audio pack 43 is recorded. The packet in which graphical data such as a character as a sub video image and a figure are contained as the sub picture pack 44 is recorded. The number of sounds recordable on DVD1 is eight and it is defined on the standard that there are 32 kinds of recordable sub video image.

[0024] The regeneration time (regeneration time corresponding to the data currently recorded between Navi-pack 41 of 1 and Navi-pack 41 which adjoins Navi-pack 41 concerned of 1) corresponding to the VOB unit 30 of 1 is recorded as having the length for 0.4 second or more. Although Navi-pack 41 certainly exists in a head in the VOB unit of 1 even if it is a case where each of the video pack 42 the audio pack 43 and the sub picture pack 44 does not necessarily need to exist and it exists the number and order are arbitrary.

[0025] Search information for Navi-pack 41 to search an image a sound etc. which you want to display finally. The DSI (Data Search Information) packet 51 which is (an address on DVD1 on which the image concerned which you want to display sound etc. are specifically recorded) etc. It is constituted by the PCI (Presentation Control Information) packet 50 which is the information about the display control at the time of displaying an image a sound etc. which have been searched based on DSI packet 51 All the video data contained in VOBU of 1 are constituted by one or more GOP (Group Of Picture) 52. The highlight information which defined a display and operation when the item was chosen to the selections chosen by the televiewer is included in the PCI packet 50. Change of a screen display to the selected item in the picture (what is called a menu screen) showing the item which a televiewer should choose by highlight information and setting out of the command (command executed corresponding to the selected item)

corresponding to the display position which should change and the selected item are performed.

[0026] Here the picture information for constituting and displaying a frame a selection button etc. required in order to constitute and display a menu screen is recorded on the sub picture pack 44 which is the above-mentioned sub video information.

[0027] The above-mentioned GOP52 is the minimum picture unit refreshable by independent [which is defined in the standard of the MPEG 2 (Moving Picture Experts Group 2) method which is an image compression system adopted when recording picture information on DVD1 in this embodiment].

[0028] Here if the outline is explained about an MPEG2 system generally in the continuous frame image the frame image before and after the frame image of one sheet is mutually similar and has correlation in many cases. An MPEG2 system is a method which generates another frame image which exists among two or more frame images concerned in the interpolating calculation based on the motion vector of an original image etc. based on two or more frame images transmitted by separating several frames paying attention to this point. In this case in recording the another frame image concerned it becomes possible to predict from two or more above-mentioned frame images with reference to them and to reproduce the another frame image concerned at the time of reproduction only by recording the information about the difference and motion vector between two or more frame images. Thereby compression record of a picture is attained.

[0029] The outline is explained using drawing 2 about the above-mentioned GOP52. Drawing 2 shows the example of two or more frame images which constitute GOP52 of 1. Although drawing 2 shows the case (the number of frame images contained in GOP52 of 1 in an MPEG2 system is not constant.) where GOP52 of 1 comprises a frame image of 12 sheets Among this the frame image shown with numerals "I" is called I picture (Intra-coded picture : intra coding picture) and says the frame image which can reproduce a perfect frame image only by its picture. The frame image shown with numerals "P" It is an estimated image which decrypts and generates a difference with the estimated image by which compensation reproduction was carried out based on I picture or other P pictures which were called P picture (Predictive-coded picture: forward prediction coded image) and were already decrypted. The frame image shown with numerals "B" It is called B picture (Bidirectionally predictive-coded picture: both-directions prediction-coding picture) The estimated image which is recorded not only on I picture or P picture but on the optical disc etc. which were already decrypted and which also uses I picture or P picture of the future for prediction in time and is played is said. In drawing 2 the arrow shows the prediction relation (interpolation relations) between each picture.

[0030] In the MPEG2 system used by DVD1 in this embodiment the data volume contained in each GOP52 has adopted the variable rate method which is not constant. That is the data volume which each picture contained in GOP52 of 1 supports the pacy animation and the data volume for constituting each picture

when the correlation between each picture is small increases therefore is contained in GOP52 of 1 also increases. On the other hand each picture contained in GOP52 of 1 supports the animation which does not not much have a motion and when the correlation between each picture is large the data volume for constituting each picture and the data volume which decreases and is contained in GOP52 of 1 will decrease.

[0031] A maker can do Type setting out free according to the intention and can make each Type record in the recording format of the layered structure shown in drawing 1 explained above. By reproducing based on the below-mentioned logical structure for every Types of these it becomes renewable [the versatility which was varied].

[0032] Next the logical format (logical structure) which combined the information recorded by the physical Type shown in drawing 1 is explained using drawing 3. As for the logical structure shown in drawing 3 information is not actually recorded on DVD1 with the structure. The information including access information or a hour entry for reproducing combining each data (especially cell 20) shown in drawing 1 by the logical structure shown in drawing 3 is the things on DVD1 currently recorded especially in CDC 11.

[0033] When it explains from the hierarchy of the low rank of drawing 3 for clarification of explanation the program 60 of 1 is constituted on logic based on a maker's intention by choosing and combining two or more cells 20 among the physical structures explained in above-mentioned drawing 1. This program 60 is also the minimum logical unit that the system controller in the below-mentioned playback equipment identifies a Type and can access by a command. A maker can also give a definition as the minimum unit which a televiewer can choose freely what summarized these one or more programs 60 and can view and listen to it and this unit is called PTT (Part Of Title).

[0034] From the program 60 of 1 choosing two or more cells 20 and being constituted logically. It is also possible to perform usage **** of what is called the cell 20 which uses the cell 20 of 1 namely reproduces the cell 20 of 1 in several different programs 60 by two or more programs 60.

[0035] Here about the number of the cell 20 of 1 when dealing with the cell 20 concerned in the physical format shown in drawing 1 it is treated as a cell ID number (among drawing 1). It is indicated as cell ID#. When dealing with it in the logical format shown in drawing 3 it is treated as cell numbers in order of the description in PGCI described later.

[0036] Next PGC (Program Chain) 61 of 1 is constituted on logic based on a maker's intention combining two or more programs 60. It is defined by the unit of this PGC 61 by PGCI (Program Chain Information) mentioned above and to the PGCI concerned. Reproduction sequence of the cell 20 for every program 60 at the time of reproducing each program 60 (by this reproduction sequence.) A peculiar program number is assigned every program 60. The address which is a recording position on DVD1 of each cell 20 The number of the leading cell 20 in the program 60 of 1 which should be reproduced playback system [of each program 60] [(when

recording information on DVD1 of this embodiment) In the time of reproduction they are random reproduction (it is the random reproduction by a random number and multiple-times reproduction of the same program 60 may be carried out.) and shuffle reproduction (although it is random reproduction and the random reproduction by the same random number). The same program 60 is reproduced only once and multiple-times reproduction of the same program 60 is not carried out. Or inside of loop reproduction (reproduce one PGC61 repeatedly.) A maker chooses the regeneration method by the combination of any one or loop reproduction random reproduction or shuffle reproduction for every PGC61 and it can be reproduced.] and various commands (it is [PGC61 or] a command which a maker can specify every cell 20) are included. Although the recording position on DVD1 of PGC1 is in CDC 11 as above-mentioned it is in CDC (not shown) in the video manager 2 (refer to drawing 1).

[0037] the data of a picture substantive besides the above-mentioned PGC1 a sound etc. will be contained in PGC61 of 1 as combination of the cell 20 if it puts in another way -- as combination of the program 60.

[0038] In PGC61 of 1 it is [that the cell 20 shown in the explanation in the above-mentioned program 60 uses also about (that is use the same cell 20 by different PGC61.)] possible. Besides the method (reproduction of a continuous-line-arrangement cell) of reproducing the cell 20 in the turn memorized by DVD1 about the cell 20 to be used A maker can choose the methods (for example the cell 20 currently recorded later is reproduced previously) (reproduction of a discontinuous arrangement cell) of reproducing regardless of the order memorized by DVD1.

[0039] Next the title 62 of 1 is constituted by 1 or two or more PGC61 on logic. This title 62 is a unit equivalent to one movie for example and is completed information which a maker wants to provide to the televiewer of DVD1.

[0040] And VTS63 of 1 is constituted by 1 or two or more titles 62 on logic. The title 62 contained in this VTS63 has an attribute common to each and the movie of the language which is different to the one same movie will be equivalent to each title 62. The information equivalent to VTS63 of 1 shown in drawing 3 is equivalent to the information included in VTS3 of 1 shown in drawing 1. That is all the information included in VTS63 on the logic shown in drawing 3 will be recorded on DVD1 as VTS3 of 1.

[0041] When a maker specifies the information classified in the physical structure based on the logical format explained above outstanding pictures (movie etc.) are formed for a televiewer.

[0042] Although it explained in explanation of the physical structure shown in drawing 1 that two or more cells 20 were recorded in order of the ID number for facilitating of an understanding of the contents In DVD1 of an embodiment the cell 20 of 1 may be actually divided and recorded on two or more interleaved unit IU shown in drawing 4.

[0043] Namely if the case where a maker constitutes PGC61A of 1 by the cell 20 which has ID numbers 12 and 4 and the cell 20 which has ID numbers 13 and 4 constitutes other PGC61B is considered as shown for example in drawing 4 When

reproducing only the cell 20 which has ID numbers 1 and 2 when reproducing information from DVD1 based on the PGC61A concerned and reproducing information from DVD1 based on PGC61B only the cell 20 which has ID numbers 1 and 2 will be reproduced. In this case when the cell 20 dissociates and is recorded for every ID number for example in PGC61A from the recording position on DVD1 of the cell 20 of ID number 1 to the recording position on cell 20 DVD1 of ID number 2 time to jump the pickup for reproduction is needed and the cell 20 of ID number 1 and the cell 20 of ID number 2 can be continuously reproduced depending on the capacity of the track buffer in the below-mentioned playback equipment (this is hereafter called seamless reproduction.).

[0044] So when shown in drawing 4 even if the input of an input signal stops temporarily corresponding to the speed of the radial transfer in the above-mentioned track buffer the cell 20 of ID number 1 and the cell 20 of ID number 2 interleaved unit IU of the length by which the continuity of an output signal is not spoiled (that is when a pickup jumps between interleaved unit IU of 1 even if the input signal to a track buffer stops) In decomposing into interleaved unit IU of the length in which an output is possible respectively and recording the output signal from the track buffer concerned continuously for example reproducing based on PGC61A only interleaved unit IU which constitutes the cell 20 corresponding to ID number 1 is detected continuously and reproducing is performed. Similarly in reproducing based on PGC61B only interleaved unit IU which constitutes the cell 20 corresponding to ID number 2 is detected continuously and it reproduces. The length of interleaved unit IU also considers the performance of drive mechanism such as a slider motor for taking the capacity of a track buffer into consideration and being determined and also performing a track jump as mentioned above and may be determined.

[0045] Thus by dividing the cell 20 of 1 into two or more interleaved unit IU and recording it by a maker's intention Also when reproducing PGC61 containing the cell 20 of a discontinuous ID number the signal outputted from a track buffer does not break off therefore the televiewer can view and listen to the reproduced image which is not interrupted.

[0046] When forming above-mentioned interleaved unit IU it is formed so that it may complete within VOB10 of 1 and two or more VOB10 which interleaved unit IU of 1 adjoins are not straddled. About the relation between interleaved unit IU and the VOB unit 30. 1 or two or more VOB units 30 are contained in interleaved unit IU of 1 It is constituted so that the VOB unit 30 of 1 may be completed in interleaved unit IU of 1 and the VOB unit 30 of 1 is divided and two or more interleaved unit IU is not straddled.

[0047] As for the above-mentioned recording formats since the above-mentioned DVD has a storage capacity [title / record one movie and also / corresponding to the movie concerned] which can also record the title of two or more kinds of languages on the same optical disc for example applying especially to DVD1 is effective.

(II) Describe the embodiment of the recorder for recording the embodiment next

the above-mentioned control information, picture information, and speech information of a recorder on DVD1 using drawing 5 thru/or drawing 7.

[0048] The composition and operation of the recorder of an embodiment are explained using introduction and drawing 5. As shown in drawing 5, the recorder S1 concerning an embodiment is constituted by VTR (Video Tape Recorder) 70, the memory 71, the signal processing part 72, the hard disk drive 73, the hard disk drive 74, the controller 75, the multiplex machine 76, the modulator 77, and the mastering device 78.

[0049] Next, operation is explained. The recorded information R which is raw materials which should be recorded on DVD1 such as music information and video information is temporarily recorded on VTR 70. And the recorded information R temporarily recorded on VTR 70 is outputted to the signal processing part 72 concerned by the demand from the signal processing part 72.

[0050] After the signal processing part 72 does the A/D conversion of the recorded information R outputted from VTR 70, it does compression processing with an MPEG2 system, does time-axis multiplex [of music information and the video information], and outputs as compression multiple-signal Sr. Then, outputted compression multiple-signal Sr is temporarily memorized by the hard disk drive 73.

[0051] In parallel to these, the memory 71 classifies the above-mentioned recorded information R into partial recorded information Pr beforehand. Based on cue sheet ST, each partial recorded information Pr was indicated to be the contents information about the partial recorded information Pr concerned. Inputted beforehand is memorized temporarily, and it outputs as contents information signal Si based on the demand from the signal processing part 72.

[0052] And based on contents information signal Si outputted from the time code Tt and the memory 71 corresponding to the above-mentioned recorded information R which is outputted from VTR 70 in the signal processing part 72, with reference to the time code Tt, the access information signal Sac corresponding to the above-mentioned partial recorded information Pr is generated and outputted, and the access information signal Sac concerned is temporarily memorized by the hard disk drive 74. The above processing is performed about the whole recorded information R.

[0053] After the above-mentioned processing is completed about all the recorded information R, the controller 75, while reading compression multiple-signal Sr from the hard disk drive 73, the access information signal Sac is read from the hard disk drive 74, additional information DA is generated based on these, and it memorizes to the hard disk drive 74. This is because some in which the contents become settled by the generation result of compression multiple-signal Sr are in various control signals. On the other hand, the controller 75 performs time management of each operation of the above-mentioned signal processing part 72, the hard disk drive 73, and the hard disk drive 74. While reading the additional information signals Sa corresponding to the additional information DA concerned from the hard disk drive 74 and outputting them, the information selection signal Scc for carrying out time-axis multiplex [of compression multiple-signal Sr and the additional information

signals S_a] is generated and outputted.

[0054]Then based on the information selection signal $S_{c\text{time-axis}}$ multiplex [of compression multiple-signal S_r and the additional information signals S_a] is carried out with the multiplex machine 76 and they are outputted as the information addition compression multiple signal S_{ap} .

[0055]And the modulator 77 modulates addition of error correction codes (ECC) such as a Reed Solomon code 8-16 abnormal condition etc. to the outputted information addition compression multiple signal S_{ap} generates disk recording signal S_m and outputs it to the mastering device 78.

[0056]Finally the mastering device 78 records the disk recording signal S_m concerned to the La Stampa disk used as the master at the time of manufacturing an optical disc (cookie cutter). And the optical disc as a replica disk generally marketed is manufactured by the replication device which is not illustrated using this La Stampa disk.

[0057]Next with reference to drawing 6 and drawing 7 details operation of the system controller 75 of the recorder R is explained. The figure for explaining operation of the system controller 75 is shown in drawing 6 and the flow chart for explaining operation of the system controller 75 to drawing 7 is shown.

[0058]Drawing 6 (A) shows the disk structure whose recording layer is a bilayer. In drawing 6 (A) L0 and L1 show a recording layer respectively and support the layer (layer) 0 and the layer 1 respectively. LI shows read in area and LO shows read out area. VGM shows a video manager's field a shows the storage capacity of the layer 0 b shows the storage capacity of the layer 1 and M shows the mid field which cannot record data.

[0059]Drawing 6 (B) shows the data volume and the layer identification flag for every VTS. Here t_i ($i = 0$ and 1 and $2 \dots n$) shows the data volume of i -th VTS. The total of VTS is n pieces. $A[i]$ shows the layer identification flag of i -th VTS and shows that i -th VTS is recorded on the layer 0 and i -th VTS is recorded on the layer 1 at the time of $A[i]=0$ at the time of $A[i]=1$.

[0060]Next with reference to drawing 7 the operation which creates the recorded information R on the system controller 75 is explained. Explanation of drawing 6 is applied also in drawing 7 as it is. VTS shall be beforehand put in order by turn with much data volume. That is it is $t_i > t_{i+1}$.

[0061]First the system controller 75 sets up $i = 1$ (Step S2) and $A[i]=0$ (step S4) and judges whether the value of i is larger than n (Step S6). One value of i is *****ed (Step S8) and the above-mentioned step S4 is repeated until the value of i becomes larger than the value of n (Step S6 YES). When Step S6 is YES all the layer identification flags are set to 0. That is at this time it is set up so that all the VTS(s) may be recorded on the layer 1.

[0062]Next if the value of i becomes larger than the value of n (Step S6 YES) the system controller 75 will set up $B_{sum} = 0$ (Step S10) and $x = 1$ (Step S12) and will judge whether the value of t_x is larger than the value of a (Step S14). That is in Step S14 it is judged in order with much data volume whether the data volume t_x of VTS is larger than the value (storage capacity of the layer 0) of a . Here B_{sum} is

the sum total of the data volume of VTS recorded on the layer 1.

[0063]Nextwhen the value of tx is larger than the value of a (i.e.when tx (x-th VTS) cannot accommodate in the layer 0) (Step S14YES)it is judged whether the value of tx is larger than the value (storage capacity of the layer 1) of b (Step S16). When the value of tx is larger than the value (storage capacity of the layer 1) of b (Step S16YES)since it cannot accommodate in the layer 1either tx (x-th VTS) displays on a display (not shown) "what x-th VTS cannot record." On the other handwhen the value of tx is below the value (storage capacity of the layer 1) of b (Step S16NO)it supposes that VTS which is the x-th is recorded on the layer 1and one value of x is *****ed (Step S20).

[0064]Nextit is judged whether the system controller 75 has a value of tx larger than the value (storage capacity of the layer 0) of a (Step S22)When the value of tx is larger than the value (storage capacity of the layer 0) of a (Step S22YES)the above-mentioned step S16S18and S20 are repeated. On the other handas for the below value (storage capacity of layer 0) case (Step S14NO) (or (Step S22NO)) of aA[x]=1 (Step S24) and alpha=tx (Step S26) are set up for the value of tx. That isx-th VTS shall be recorded on the layer 0and the data volume of x-th VTS is set as the parameter alpha.

[0065]And the system controller 75 *****s one value of x (Step S28)and it is judged whether the value of x is larger than the value of n (Step S30). When the value of x is below the value of n (Step S30NO)beta=alpha+tx is calculated (Step S32) and it is judged whether the value of beta is larger than the value (storage capacity of the layer 0) of a (Step S34). Herebeta is the sum total of the data volume of VTS recorded on the layer 0.

[0066]When the value of beta is larger than the value (storage capacity of the layer 0) of a (Step S34YES)the above-mentioned step S28S30and S32 are repeated. When the value of beta is below the value (storage capacity of the layer 0) of a (Step S34NO)the value of alpha is transposed to the value of the above-mentioned beta (Step S36)A[x]=1 is set up (Step S38)and it returns to the above-mentioned step S28. On the other handwhen the value of x is larger than the value of n (Step S30YES)i= 1 is set up (Step S40) and it is judged whether it is A[i]=0 (Step S42). In the case of A[i]=0 (Step S42YES)Bsum = Bsum+ti is computed (Step S44)and it *****s one value of i (Step S46). One value of i is *****edwithout adding the value of Bsum in the case of A[i]=1 (Step S42NO) (Step S46). Thenit is judged whether the system controller 75 has a value of i larger than the value of n (Step S48). When the value of i is below the value of n (Step S48NO)the above-mentioned step S42S44S46and S48 are repeated. When the value of i is larger than the value of n on the other hand (Step S48YES)That isit is judged whether it is Bsum > b after calculating Step S44 about all the VTS(s) recorded on the layer 1 and calculating the sum total Bsum of the data volume of VTS which should be recorded on the layer 1 (Step S50). When the value of Bsum is larger than the value (storage capacity of the layer 1) of b (Step S50YES)Since the sum total Bsum of the data volume of VTS which should be recorded on the layer 1 cannot accommodate in the layer 1it displays on a display

(not shown) that it is "VTS is record impossible." When the value of Bsum is below the value (storage capacity of the layer 1) of b (Step S50NO) the data of VTS which should be recorded on the layer 1 is recorded on the layer 1 and processing is ended. Thus the above-mentioned recorded information R is created. [0067] Since according to the Information Storage Division device of the above-mentioned composition it constitutes so that video information may be recorded on the information recording medium of the two-layer structure by making each VTS into the minimum unit namely since he is trying to record on the information recording medium of the two-layer structure without dividing each VTS Since it is not necessary to necessarily reproduce data continuously over two-layer one Even if it is a case where the layer which is playing the optical disc of the two-layer structure is switched without enlarging capacity of the track buffer of playback equipment or reducing reproduction speed it is seamlessly refreshable in each data group.

(III) Describe working example of the information recording medium on which information was recorded by the above-mentioned recorder next working example of the information recording medium on which information was recorded by the above-mentioned Information Storage Division device with reference to drawing 8. In the information recording medium shown in drawing 8 the video manager VMG and VTS1 and VTS2 are recorded on the layer 0 and VTS3 VTS4 and VTS5 are recorded on the layer 1. LI shows read in area LO shows read out area and M shows the mid field which cannot record data. Thus since information is recorded without dividing each VTS the fields GAP1 and GAP2 where information is not recorded on the layer 0 and the layer 1 respectively are formed. In working example shown in drawing 8 although VTS is centralized on the mid field side it is recordable on the arbitrary positions of each layer in the state where each VTS is not divided. The field (GAP) where two or more information is not recorded on each layer can be provided.

[0068] Thus since video information is recorded on the information recording medium of the two-layer structure by making each VTS into the minimum unit according to the information recording medium shown in drawing 8 namely since it is recorded on the information recording medium of the two-layer structure without dividing each VTS Since it is not necessary to necessarily reproduce data continuously over two-layer one Even if it is a case where the layer which is playing the optical disc of the two-layer structure is switched without enlarging capacity of the track buffer of playback equipment or reducing reproduction speed it is seamlessly refreshable in each data group.

[0069]

[Effect of the Invention] As explained above while the data group which has either [at least] video information or speech information is recorded on the 1st recording layer that has the 1st storage capacity as the minimum unit according to the information recording medium according to claim 1 Since the data group which has either [at least] video information or speech information is recorded on the 2nd recording layer that has the 2nd storage capacity as the minimum unit Even if

it is a case where the layer which is playing the optical disc of the two-layer structure is switched without enlarging capacity of the track buffer of playback equipment or reducing reproduction speed it is seamlessly refreshable in each data group.

[0070] According to the Information Storage Division device according to claim 2 to the information recording medium which has the 2nd recording layer that has the 1st recording layer and 2nd storage capacity that have the 1st storage capacity. It faces recording two or more data groups which have either [at least] video information or speech information respectively. Since each data group is recorded on the 1st recording layer one by one when the sum total of the data volume detected by the data volume detection means is calculated one by one and the sum total of the calculated data volume concerned is judged to be said below 1st storage capacity. By making each data group into the minimum unit it constitutes so that video information may be recorded on the information recording medium of the two-layer structure. For this reason since it faces reproducing the information recording medium recorded by doing in this way and it is not necessary to necessarily reproduce data continuously over two-layer one it is seamlessly refreshable even if it is a case where the layer which is playing the optical disc of the two-layer structure is switched without enlarging capacity of the track buffer of playback equipment or reducing reproduction speed.

[0071] Also with the Information Storage Division device according to claim 3 or 4 the same effect as the Information Storage Division device according to claim 2 is done so.

DESCRIPTION OF DRAWINGS

[Brief Description of the Drawings]

[Drawing 1] It is a figure explaining the recording format (physical recording format) on DVD of video information and speech information.

[Drawing 2] It is a figure showing the example of two or more frame images which constitute one GOP.

[Drawing 3] It is a figure showing the logical format (logical structure) which combined the information recorded by the physical Type shown in drawing 1.

[Drawing 4] It is a figure for explaining the case where the cell 20 of 1 is divided and recorded on two or more interleaved unit IU.

[Drawing 5] It is a block diagram of the recorder for recording control information, picture information and speech information on DVD.

[Drawing 6] It is a figure for explaining operation of the system controller.

[Drawing 7] It is a flow chart for explaining operation of the system controller.

[Drawing 8] It is a figure showing the data structure of the information recording medium with which information was recorded with the Information Storage Division device by this invention.

[Description of Notations]

1 -- DVD
2 -- Video manager
363 -- VTS
10 -- VOB
11 -- CDC
20 -- Cell
30 -- VOB unit
41 -- Navi-pack
42 -- Video data
43 -- Audio information
44 -- Sub picture data
50 -- PCI data
51 -- DSI data
52 -- GOP
60 -- Program
6161A61 B--PGC
62 -- Title
70 -- VTR
71 -- Memory
72 -- Signal processing part
73 -- Hard disk drive
74 -- Hard disk drive
75 -- Controller
76 -- Multiplex machine
77 -- Modulator
78 -- Mastering device
ST -- Cuesheet
Sr -- Compression multiple signal
Si -- Contents information signal
Sac -- Access information signal
Sa -- Additional information signals
Scc -- Information selection signal
Sm -- Disk recording signal
Sap -- Information addition compression multiple signal
Tt -- Time code
R -- Recorded information
Pr -- Partial recorded information
